

There is some doubt about the time that the storm reached Leakey and Utopia. Some reported it to be near midnight. This would give the tornado a movement of less than 15 miles per hour, which is unlikely. Another tornado hit in Uvalde County about 60 miles south of Rocksprings the same night of the disaster; is reported to have traveled south and turned west, passing over an uninhabited section. It is possible that three separate tornadoes occurred.

Rocksprings is the county seat of Edwards County, with a population of about 1,200. It is an inland town, situated 39 miles from a railroad, upon a high, rolling plateau; the elevation is 2,450 feet. The surrounding country is devoted to livestock raising, wool, and mohair production.

No town was ever nearer completely wrecked than was Rocksprings. The tornado hit at 7:50 p. m. without warning. The day had been rather warm and a thunderstorm, apparently of moderate intensity, was hanging north of the town, promising a spring shower. Just before dark a fresh wind from the southeast dropped to a dead calm. The cloud to the north was noticeably red at this time and seemed to be swinging eastward. A few moments later scattered hail 2 inches or more in diameter began to fall, increasing in size to baseballs. The hail is described as being round but covered with bumps, and the noise of this hail falling on the houses was heard a half mile away, which was the first warning many people had of the approach of a severe storm.

People in different parts of the town describe the wind as blowing from different directions. Some state that for two minutes before their houses collapsed the wind was from the northeast or north and increasing in strength. Others say that from a dead calm a west wind hit their house, lifting it from the ground. The destructive wind lasted about one and one-half minutes, but wreckage

continued to move about for around 10 minutes or more. No rain fell until after the passage of the tornado and no measurement of the amount was made, although a heavy electrical storm followed, with probably an inch of rain. Surrounding districts received 2 to 3 inches.

People 50 to 60 miles away observed a red, some say a yellowish, cloud over Rocksprings. No funnel-shaped cloud was seen from the town. Those that happened to be looking at the sky to the north just before the tornado came state that the cloud seemed to dip suddenly to the ground near the town. Hail was falling at this time and a great roar and grinding noise was heard by all. A minute and a half later but 12 buildings were standing. Numbers of buildings entirely disappeared even to the foundations, leaving no trace of lumber or contents. Many injured people were further bruised and cut by heavy hail that continued to fall after the passage of the tornado, as no shelter was available. Concrete and stone failed to withstand the terrific fury of the storm and heavily constructed buildings were left gaping ruins. The courthouse and post office partly escaped the tornado, but caught fire and burned.

Because of the unusually large diameter of the tornado to an observer viewing the debris from any one ground position it would seem that the damage was the result of a straight blow, but in reality the counterclockwise rotary motion of the tornado was definitely indicated by the fall of the buildings and chimneys. Blocks of houses in the northern portion of the town fell to the south and southeast, while across the central portion they went to the east, and in the southern part of the town houses fell toward the northeast, with one going northwest.

A cement church appeared to have been wrecked by expansion of air. The walls were cracked or broken about 12 feet above the floor and bulged outward 1 to 3 feet, although still standing.

### OBSERVING A TORNADO'S LIFE

By T. G. SHIPMAN

[Weather Bureau, Fort Smith, Ark., May 18, 1927]

The morning weather map of April 12, 1927, showed a shallow low-pressure area apparently with a western center in Arizona and an eastern one in Kansas. Pressure in Arizona was about 29.68 inches and in Kansas 29.64 inches. Northward of this depression was a moderately strong HIGH. Warm, sultry weather prevailed over the regions under the influence of the LOW, while it was much colder northward. A well-defined wind-shift line appeared over western Kansas. The evening map showed much the same weather conditions, with the depression center farther south. General weather conditions were sluggish, local conditions warm and sultry, and the tornado which occurred at Fort Smith on this date had a very slow progressive motion and only moderate intensity.

The tornado developed within one-quarter to one-half mile of the station, with the edge of the storm very near it, and was observed through its short existence by both employees on duty. Only weak instrumental effects were noted at the station, which is unusual for such close proximity to a tornado. Pressure showed a drop of 0.04 inch and a rise of 0.06 inch, about the average for a thunderstorm. The temperature drop was small, and the wind attained a maximum velocity of 24 miles an hour, with an extreme velocity of only 34 miles an hour. No wind velocity records were made within the path of the tornado, but estimates from effects would place it at about 100 miles an hour.

The sky was cloudy all day. Cloud and surface records showed several air strata with varying directions. At 7:00 a. m. five-tenths alto-stratus clouds from the west, five-tenths alto-cumulus clouds from the south, and a surface wind from the east were recorded. At 12:18 p. m. ten-tenths strato-cumulus clouds from the southwest and a surface wind from the southeast were recorded. At 4:20 p. m., just after the tornado, four-tenths alto-stratus clouds with undetermined direction, five-tenths strato-cumulus clouds from the west, one-tenth cumulo-nimbus clouds from the west, with a surface wind from the northwest were recorded. At 7:00 p. m. seven-tenths strato-cumulus from the southwest, three-tenths cumulo-nimbus from the southwest, and a surface wind from the northeast were recorded. All observations were made by the same employee and personal equations may be disregarded. Every wind direction was recorded in some air strata during the day either by cloud observation or instrumental records. Upper-air currents were southerly to westerly as far as cloud observations showed, and surface currents easterly. This territory has considerable local atmospheric stratification.<sup>1</sup> Six tornadoes have been recorded at Fort Smith beginning with 1879.

Tornado signs appeared at about 4:00 p. m., central time. Heavy rains were noted west of the station in Oklahoma just before 4:00 p. m. Seemingly very low-

<sup>1</sup> MONTHLY WEATHER REVIEW, December, 1925, 53:535-536.

lying scud was noted through office windows at 4:03 p. m., just east of the station. Clouds moved in opposite parallel paths, one from the north and one from the south. *These opposite parallel currents were so arranged that if any right-hand deflection took place a diminution of air pressure would develop between them.* After a short interval, a vortex apparently formed without a funnel cloud. Under the vortex débris rose, appearing like cinders or light trash ascending to the clouds. After observing this for about one minute both station employees ascended to the roof of the Federal building for better observing. Open sky was noted to the north, east, and south near the horizon, but the horizon was obscured to the west. The break in the clouds near the horizon afforded an excellent opportunity for observation of the formation of the small but energetic tornado whirl, and the light from the break probably diminished the dark hue of the clouds as they seemed more slate-colored than tornado clouds are usually described. Light thunder and lightning were recorded near the beginning of the storm.

The converging and turmoil of the clouds were observed from the roof of the building by Weather Bureau employees for about one minute. The movement was east-southeast. A short, heavy rain and light hail lasted about one minute at this time. After the ending of the rain, skies began to clear on the western horizon and darken on the eastern.

The first actual destruction, as witnessed by Weather Bureau employees, took place at 4:04 p. m. Houses were reported damaged a little earlier at 814 Wheeler Avenue, near Emma Street, at 4:02 or 4:03 p. m. Unofficial reports from persons in the open indicated a cloud at this time, but it is hard to determine whether they saw a tornado cloud or the turbulent cloud activity, but the latter is thought to be the case. At 4:04 p. m. the débris shot upward under the vortex in a cloud of dust. The ascending wreckage had the appearance of a great explosion or sparks from a great fire and was distributed in horizontal strata until drawn into the vortex. Watching the successive ascending phenomena gave one the impression that the seat of energy was above the earth and the ground features were the result of suction. These formations appeared three successive times, without a tornado cloud being formed. Each successive formation seemed to accumulate strength and to produce worse effects than the preceding one. Effects were very similar to blasting operations. The time interval between the first and second was about 1 minute and between the second and third about 30 seconds.

The fourth ascending formation was marked by a descending cloud resembling a misshapen cornucopia which failed to reach the ground, and was accompanied by

a larger amount of dust and wreckage. This dissipated after about one minute and re-formed. The fifth formation, or second funnel cloud, appeared as two large bells top to top with a thin ropelike pendant connecting them. This was the most distinct, sharply defined, and beautiful of the entire series and lasted only a few seconds. The sixth formation and third funnel cloud formed in a few seconds. The ascending débris reached the dimensions of a giant explosion. The formation widened, accompanied by rain and a cloud of débris, and moved slowly to the northeast, finally disappearing. The greatest destruction occurred with the sixth ascending phenomenon. Airplane observations afterwards showed that the path narrowed before the storm dissipated, which feature could not be observed from the roof of the building. Débris lay in practically straight lines parallel to the path of the storm for the last quarter of mile of the path. Sounds, as heard at some distance from the storm, resembled the hum of a motor, but they were quite harsh and loud near the storm area.

An imposing display of towering cumulus and cumulonimbus clouds was observed in the direction in which the tornado disappeared, resembling cumulus formed over great fires. The pictures of the tornado at Austin, Tex., May 2, 1922,<sup>2</sup> would almost fit the tornado at Fort Smith, April 12, 1927.

The path of the tornado was not more than 4 miles long and about 150 yards wide. The tornado varied in strength and direction throughout its path. The path ran generally from the southwest to the northeast and lay about one-half mile east of the tornado of January 12, 1898.<sup>3</sup> Two persons were killed and 13 injured seriously enough to require hospital attention. The damage was estimated at \$100,000. The strength of the storm was only moderate for a tornado, with only a few examples of total wreckage. Houses were unroofed, awnings torn down, fences moved, trees uprooted, garages destroyed, and light buildings moved from foundations. Absence of marked tornado freaks was also noted.

Few freak conditions, often reported from tornado districts, could be found. A child was taken up by the wind, carried for 3 miles, and let down scratched but not injured. A woman, evidently killed in the tornado area, was found 7 miles away. A number of automobile tires were carried a mile and dropped. A heavy timber, 14 by 14 inches and 12 feet long, was carried half a mile south of town. Hundreds of chickens disappeared and engines were stripped from automobiles. There was no way even to estimate the excessive wind velocity, but the photographs [not reproduced here] make it certain that it was hundreds of miles per hour.

<sup>1</sup> MONTHLY WEATHER REVIEW, May, 1922, 50: 252-253.  
<sup>2</sup> MONTHLY WEATHER REVIEW, January, 1898, 26: 18-19.

#### VARIABLE FEATURES OF BAROMETRIC DEPRESSIONS AND ANTICYCLONES AS A BASIS FOR SEASONAL FORECASTING

By N. A. HESSLING

[In charge of daily forecasting service of the Argentine Meteorological Office]

For a country like Argentina, with *extensive* rather than *intensive* farming, seasonal forecasts would undoubtedly be of much more practical use than daily forecasts of the weather. For this reason, for some time, I have been trying to find a basis for such forecasts. Correlations between different meteorological elements in various parts, along the lines followed by Walker in India, have been found, but they are generally too vague to be of any practical value, at least by themselves, and the same

may be said of relations with sun spots, solar radiation, etc.

Since I have been engaged in daily forecasting of the weather, I have been struck by the remarkable tendency of certain types of pressure distribution and weather to repeat themselves in some years or seasons, while in other years the opposite types are more frequent. Some types bring dry weather and others wet weather, and the prevalence of each type determines the dryness or wetness